

**REMARKS**

The preceding amendments to Claims 8 and 18 serve to clarify that the addition of an alcohol and additional base in step d) to the previously formed organic phase results in the formation of an alkaline reaction mixture, which is then subjected to phase separation in step e).

In addition, the amendment to Claim 8 serves to alter the claim language such that "said" is now replaced by "at least one" with respect to the alcohol that is added in step e) of the claimed process.

Finally, the above amendment to Claim 18 serves to correct an inadvertent error by which there were two occurrences of the word "of" in the preamble of the claim, after the phrase "... preparation of polyisocyanates..." and before "... the diphenylmethane series...". The amendment to Claim 18 serves to delete one of these two occurrences.

Claims 1, 8-11 and 18-24 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner stated three reasons for this rejection.

First, the Examiner stated that it was "unclear from the claim language how the aqueous phase is generated. Does it stem solely from the water produced with the neutralization step? Since the instant claims are process claims, the origin of the aqueous phase within the process should be clarified." Applicants respectfully disagree with this and have provided arguments below.

Second, the Examiner indicated that within step d) of Claim 8, there was no antecedent basis for the language "said alcohol". Applicants respectfully submit that this issue is moot in view of the preceding amendment to Claim 8.

The third reason provided by the Examiner was that "it is not clear that antecedence exists in Claims 8 and 18 for "the alkaline reaction mixture from d)". It is respectfully submitted that this issue is also moot in view of the preceding amendments to Claims 8 and 18.

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With regard to the position by the Examiner that the claim language does not clarify how the aqueous phase is generated, Applicants respectfully submit that one skilled in the art of isocyanate chemistry would know and understand that the acid condensation of the aniline and formaldehyde inherently forms water as a by-product. Thus, water is inherently formed in step a) of Claims 1, 8, 11 and 18. One of ordinary skill in the art who makes amine-precursors for isocyanates would recognize that one of the by-products formed in this step is water. The fact that this reaction inherently produces water and such information is routine knowledge to one of ordinary skill in the art supports the position that it is not necessary for the present claim language to expressly state that water is formed as a by-product in this step. Applicants are willing to provide a publicly available reference which documents this fact if considered necessary by the Examiner. Ultimately, this water "contributes to" the aqueous phase.

The aqueous phase may also be "contributed to" by the selection of certain bases to neutralize the reaction mixture. This is discussed in the present specification on page 6, lines 11-16. A targeted addition of water may also be used in some embodiments of the invention as disclosed on page 9, line 25 through page 10, line 3. Thus, in addition to the water that is inherently formed in the condensation reaction of aniline and formaldehyde, there are also other aspects of the process of forming di- and polyamines of the diphenylmethane series which may "contribute to" the aqueous phase.

It is, however, Applicants' position that the aqueous phase is essentially a by-product of the process that inherently results from preparing di- and polyamines from the reactants aniline and formaldehyde, and of neutralizing the reaction mixture with a base. It is at the phase separation step, i.e. step c) of Claims 1, 8, 11 and 18, that the neutralized reaction mixture is separated to form the two phases, i.e. the organic phase and the aqueous phase. Until this phase separation occurs, the aqueous phase and the organic phase are combined together in a mixture. Thus, the aqueous phase is actually formed in step c) by the phase separation. As described above, however, different aspects of the process "contribute" to the aqueous phase. Accordingly, Applicants respectfully submit that the process as presently claimed particularly points out and distinctly claims the subject matter

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which is regarded as the invention. It would be inaccurate to state and/or claim that the aqueous phase is "formed" in step a) and/or step b) of the presently claimed process because until the phase separation occurs in step c), the aqueous phase and the organic phase are combined together in the reaction mixture. Therefore, the origin of the aqueous phase is accurately reflected by the present claim language.

In addition, this claim language, combined with the knowledge of one of ordinary skill in the art and the present specification, clearly supports Applicants' position that the second paragraph of 35 U.S.C. § 112 is satisfied. The proper standard for determining whether the claims satisfy the second paragraph of 35 U.S.C. 112, as set forth *In re Moore and Janoski*, 169 USPQ 236 (CCPA, 1969), is based on the analysis of the claim language employed in view of the prior art teachings and of the application disclosure as interpreted by one skilled in the art. For the reasons discussed above, Applicants respectfully submit that one of ordinary skill in the art would have absolutely no difficulty in understanding exactly what Applicants are presently claiming, or in understanding how the aqueous phase is generated. Accordingly, it is respectfully submitted that this basis for the rejection under the second paragraph of 35 U.S.C. § 112 is improper, and Applicants request that it be withdrawn.

Claims 1, 9-11, 19 and 20 were rejected under 35 U.S.C. 102(b) as being anticipated by the Adkins et al reference (U.S. Patent 5,312,971).

It is Applicants' understanding from the rejection as stated by the Examiner in the Final Office Action dated June 10, 2005 and as repeated above, that Claims 8 and 18 are patentable over the Adkins et al reference.

A process for the production of polymethylene polyphenyl polyisocyanates is disclosed by the Adkins et al reference. This process comprises reacting aniline and formaldehyde in the presence of an acid catalyst (e.g. aqueous hydrochloric acid) to yield polyamines of the diphenylmethane series. These polyamines are isolated from the reaction mixture by adding a neutralizing agent, typically sodium hydroxide, and then any excess neutralizing agent, water and aniline is removed. These polyamines are phosgenated to yield the corresponding polyisocyanates. Also, the process

requires the addition of a reducing agent (to reduce the color of the corresponding polyisocyanates) at a point after adding the neutralizing agent but before stripping of the solvent used for phosgenation. (See column 1, lines 46-62.)

Applicants respectfully submit that the presently claimed invention is not obvious to one of ordinary skill in the art from the Adkins et al reference.

It is evident from the express claim language and the present specification that the color reduction in the polymethylene polyphenyl-isocyanates is due to the addition of one or more alcohols to the reaction mixture (1) at the beginning of step b), (2) during step b) or (3) after step b) and before step c), in amounts such that the molar ratio of alcohol to formaldehyde is at least 0.02:1. Step b) is the neutralization step, and step c) is the phase separation step. Applicants respectfully submit that the Adkins et al reference does not suggest to one of ordinary skill in the art that the addition of an alcohol at any point during the process of preparing polyamines of the diphenylmethane series and/or of preparing the corresponding polyisocyanates from these polyamines, will reduce the color of the products! This is simply not suggested by this reference!

The Adkins et al reference discloses suitable reducing agents (see column 2, lines 3-13) as including boron hydrides, boron halides, metal hydrides, alkali metal alkoxides and hindered phenols. It is also disclosed (see column 2, lines 22-33) that it may be necessary to quench the mixture when a highly reactive reducing agent such as, borane-tetrahydrofuran, is used in the process. Suitable components for quenching include low molecular weight monohydroxyl compounds, preferably monoalcohols, and most preferably methanol (see column 2, lines 23-29).

It is evident from that the express disclosure of the Adkins et al reference does not disclose or suggest that the low molecular weight monohydroxyl compounds or monoalcohols such as, for example, methanol, either improve or decrease the color of the resulting polyamines or polyisocyanates. Rather, this reference clearly discloses that the reducing agents are effective in reducing the color of the corresponding polyisocyanates (see column 1, lines 54-59). It is expressly stated that "a relatively small amount of reducing agent added to the polyamines can result in a significant reduction in color of the corresponding polyisocyanates" (column 1, lines 34-36), and that these are effective in "reducing

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the color of the corresponding polyisocyanate if they are added at any time following the addition of the neutralizing agent and before the stripping of the solvent used for phosgenation" (column 1, lines 55-59). It is simply not disclosed or suggested by the Adkins et al reference that the low molecular weight monoalcohols such as methanol can effectively decrease the color of the resulting polyamines and/or polyisocyanates.

In fact, the working examples of this reference lead the skilled artisan to the opposite conclusion. One of ordinary skill in the art would not expect that the addition of a monohydroxyl compound or a monoalcohol to reduce the color of polyamines of the diphenylmethane series and/or of the corresponding polyisocyanates upon reading the examples of the Adkins et al reference.

Examples 1 and 2 of this reference use a 1M- borane-tetrahydrofuran complex as the reducing agent (see column 2, lines 59-61; and column 3, lines 30-33). These two examples also clearly add a methanol quench to the reaction solution after the reducing agent (1M- borane-tetrahydrofuran complex) was added. (See column 2, lines 63-65 and column 3, lines 33-34.) Then, in both examples, the resultant polyamines were phosgenated to form the corresponding polyisocyanates. The color of the resultant PMDI's was measured at both 430 nm and 520 nm absorption, and compared to that for PMDI's prepared in the same manner except with no reducing agent. The results are reported at column 3, lines 11-16 for Example 1, and at column 3, lines 45-50 for Example 2. Example 1 and Example 2 were again repeated, except a methanol quench was not used (column 3, lines 17-18 and column 3, lines 51-52). These absorptions at 430 nm and 520 nm were then compared to those and reported for PMDI's prepared with no reducing agent (column 3, lines 18-23 and column 3, lines 52-57).

It is readily apparent from both Examples 1 and 2 that the greatest decrease in color reduction was seen when only a reducing agent, i.e. 1M- borane-tetrahydrofuran complex, was used. See column 3, lines 17-24 and column 3, lines 51-57. It is evident from the % decrease in color seen in these examples that methanol quench described in Examples 1 and 2 of the Adkins et al reference had a negative effect on the percent decrease in color at both 430 nm and 520 nm. In fact, when comparing the % decrease for PMDI in which the polyamine was subjected to

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both a reducing agent and a methanol quench, vs. no reducing agent, vs. no methanol quench, it is readily apparent that the values for no methanol quench resulted in the highest (i.e. greatest or largest percent) reduction in absorption at both 430 nm and at 520 nm.

This leads the skilled artisan to conclude that the reducing agent alone provides the greatest improvement in decreasing the color of the PMDI, and that a methanol quench inhibits and/or reduces the ability of the reducing agent to decrease the color of the PMDI. Therefore, one of ordinary skill in the art would not expect and/or believe that methanol alone or another low molecular weight monoalcohol would be effective in reducing the color of PMDI in the absence of the reducing agents required by this reference. Such a conclusion is clearly contrary to the results of Examples 1 and 2 of the Adkins et al reference, when considered in their entirety by the skilled artisan.

It is respectfully submitted that the presently claimed invention is rendered obvious under 35 U.S.C. § 103(a) by the Adkins et al reference.

In view of the above amendments and remarks, Applicants respectfully submit that each of these rejections is in error and request that they be withdrawn. The allowance of Claims 1, 8-11, and 18-24 is respectfully requested.

Respectfully submitted,

By



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